THE ECONOMIC COSTS AND OPTIMAL MACHINERY FOR COVER CROPS IN KENTUCKY

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Abstract: This paper uses a linear-programming resource allocation model combined with sequencing and machinery selection to optimize the practices and machinery utilization of a Kentucky grain farm. After establishing a base model, further models were developed to evaluate the adoption of cover crops into a traditional row crop system. This was accomplished through maximizing returns over selected costs at various acreage adoption levels. Additionally, a decision tool was developed to assess the costs related to cover crop adoption. The results show a $30 per acre cost to adopt 1000 acres of cover crops when no benefits were considered.

Keywords: Cover Crops, Machinery Selection, Weather Risk, Nutrient Leaching, Soil Erosion, Farm Management

Introduction: Across the United States, farmers are increasing the number of acres planted in cover crops. In 2017, there were 15.4 million acres planted nationally, covering 4% of total cropland, whereas only 10.3 million were planted in 2012 (Dreibus, 2019). In 2018, Kentucky farmers planted 205,199 acres of cover crops, which is only 5% of the total cropland in the state (USDA, 2019). The low percentage of cover crops planted does not reflect their potential economic value.

The short-term benefits of cover crops include nitrogen fixation, nitrogen leaching reduction, weed suppression, compaction prevention, and grazing potential. Cost recovery for these benefits has been estimated to be as high as 150% of the initial cost (Lynn, 2018). However, some have suggested that the long-term benefits of cover crops will be the only way to make them economically feasible, with the most notable impacts in preventing soil erosion and nitrogen leaching (Fatka, 2018). For example, cover crops have been shown to reduce nitrogen leaching into soil water by 75-97% (Cooper, 2017). Likewise, cover crops slow water runoff and reduce soil erosion (NRCS, 2019). Although the benefits are farm-specific, Kentucky lost an estimated

1.73 billion tons of soil on 406.4 million acres of cropland in 2007 (NRCS, 2012), showing the potential statewide effect of implementing cover crops to prevent soil erosion.

Some suggest the reluctance to incorporate cover crops into their production practices comes from the potential negative impact on cash crop production. When cover crops are implemented, operations often will be strained with capital, labor, and available field days. Although these issues are not guaranteed to happen in every operation, limitations can be handled by modifying or adapting management practices in most operations. Furthermore, additional equipment may be required to implement cover crops, which comes at a financial cost. When farmers initially integrate cover crops into their production practices, there is potential for negative net returns. However, this cost may be recovered over time by realizing the aforementioned long-term benefits.

This study aims to determine the whole farm economic impacts of implementing cover crops on a grain farm in Kentucky. To accomplish this goal, the objectives are 1) develop a whole farm model incorporating cover crop adoption; 2) develop an Excel-based tool for determining the direct economic cost of implementing cover crops to support objective 1; 3) determine the impact on net returns from implementing 1000-acres of cover crops; 4) determine the impact of cover crop acreage levels on net returns; 5) determine the optimal machinery needed for adoption; 6) determine the impact on planting dates of the cash crop due to cover crop adoption; 7) determine the effect of suitable field day risk on objectives 3,5, and 6. Initial results from the model found that net returns decreased by 5% when a cover crop was adopted on 1000 acres with no benefits incorporated.

Background: Adopting cover crops is a farm-specific decision and depends on the farmer's overall goals. However, cover crops need to be profitable for industry-wide adoption in production agriculture. The work presented in this paper will focus on the impact on net returns from cover crop adoption and provide estimates for losses that will need to be offset by either benefit from cover crops or government payments. Previous literature shows the impact on net returns has commonly been evaluated using partial budgets, although others have estimated the changes using enterprise budgets or cost recovery estimations (Duzy, 2017; Duzy, 2016;

Plastina, 2018; Zhou, 2017; Ellis, 2020). When these are compared, the change in net returns ranged from -$33.08 to $25.92 per acre of planted cover crop. The wide range is due to various costs of adoption that can be between $17.40 to $206.10 per acre (Roth, 2017).

Once the costs are established, cost recovery estimates can be established. These benefits include soil erosion prevention, nitrogen leaching prevention, water retention, and increased cash crop yields (Balkcom, 2016; Cooper, 2017; Flower, 2012; Roth, 2017). Although each benefit is farm-specific, previous work has estimated a range of values for these benefits. Soil erosion and nitrogen impacts have been extensively studied compared to other benefits. Soil erosion control has been estimated from $4.50 to $16 per acre per year (Roth, 2017; Lynn, 2018) in the short term. However, soil erosion prevention is much more notable in the long term, with estimates as high as $340 per acre solely due to eroded soils that can increase if the erosion continues (Duffy, 2012). As for nitrogen leaching, up to $50 per acre in savings is associated with decreased fertilizer use (Lynn, 2018). At the same time, other studies found that cover crops can reduce nitrogen leaching by between 40-97% (Cooper, 2017).

Cover crops will also influence cash crop yields. On-farm studies indicate an average yearly increase of 33 bushels per acre of corn over the four-year study (Lynn, 2018). However, initially yield impacts are much more modest, ranging from -11.25 to 56.09 bushels per acre, with an average of around 5 bushels per acre (Faska, 2018; Plastina, 2018). By comparison, soybeans demonstrated an average increase of only 3 bushels per acre (Fatka, 2018). With either crop, yield increases can account for a $10-20 per acre increase in revenue, but not all studies have found yields increase. Roth estimated a 6.2% loss in corn when using cover crops (2017).

Material and Methods: The experimental framework of the study included a mathematical programming model, cover crop budget, resources of a hypothetical no-till Kentucky grain farm, and suitable field day conditions for Kentucky. To achieve the objectives, a mathematical programming model was modified by Ellis (2020) to include machinery selection, suitable field days, and sequencing of field operations related to adopting cover crops and can be found in the appendix.

The objective of this model is to maximize net return above the selected cost. Decision variables of the model include acres of each crop (corn and full-season soybeans) production by planting date, acres of cover crops for both termination and planting by date, and what machinery to use for the cover crop operations. A complete list of the available machinery for the model can be found in table 1. The model optimized cover crop planting and crop termination machinery based on the number of cover crop acres. In total, 140 different machinery combinations were included in the model.

The selected costs represented in the model included variable and ownership costs for both cash crop and rye cover crop. Rye was the only cover crop used in this study because of its wide use and availability in the area of study. Furthermore, once discussed with seed providers around the farm's location, most suggested using rye based on the cost of the seed for the farmer. The cash crop variable costs were derived from Halich (2019) enterprise budgets and MSBG for a non-irrigated Kentucky farm. An enterprise budget tool was developed as stated for objective two to establish cover crop cost. This tool utilized input machinery information to determine variable and ownership costs. Input costs associated with cover crops include herbicide and seed and reflect local sale prices from 2018. Machinery costs acquired from MSBG included purchase price, salvage value, repairs & maintenance rates, useful life, annual use rate, and performance rate of the various machinery in the model to generate machinery costs of cover crop practices. The tool allowed for selecting specific planting and termination methods to determine variable and ownership costs. The output from this decision tool was used for ownership costs of establishing rye (Figure 2.2).

The model considered no benefits related to cover crops due to previous literature's highly variable estimation. As mentioned in the previous section, the cover crop benefits are farm-specific and, therefore, different for each farm.

To determine gross returns, the average monthly price per bushel for Kentucky was calculated for both corn and soybeans from April 2015 to April 2019 and used as the expected price in the model (USDA). Corn was estimated at $3.91 per bushel, while soybeans were $10.24 per bushel. The expected yield for corn and soybeans was variable and calculated using Beck's yield curve, where a percentage of yields are expected based on the planting date (Figure 2.1). In this model, the expected yield for corn was 147 bushels per acre, while soybean yields were expected to be 48 bushels per acre if the crop was planted at the optimal time.

To establish a baseline for Kentucky producers, a hypothetical farm was used. The hypothetical farm was located in Henderson County, Kentucky. The operation contains 2,100 acres of available cropland, with the previously mentioned 50/50 crop rotation practicing no-till farming. The machinery set for cash crop production includes one 190-hp 4WD tractor with the following implements: a split row no-till planter (12 rows), a liquid fertilizer applicator, a 500-bushel grain cart, and a 20-foot stalk shredder. A 335-hp harvester is used for both corn and soybeans using either a 12-row flex header or a 25-foot flex header for soybeans. The farm also utilizes a 90-foot self-propelled sprayer for herbicide pre-planting burndown and post-planting weed control for corn and soybeans. Additionally, the operation owns a 225-hp 4wd tractor, which is only used for fertilizer application in corn. However, this tractor will be utilized if cover crop termination includes a roller/crimper over 30-foot.

Suitable field day risk data from Shockley and Mark (2017) was incorporated to evaluate weather risk in Kentucky. This allows the model to assess changes that will occur due to weather. Weather risk is assessed as a percentage value to demonstrate the amount of rain expected. The 50th percentile represents a risk-neutral scenario or an average year of rainfall and was used in the base case to compare cover crop adoption levels. To represent a traditional one-person operation, a 12-hour workday was used for calculating labor availability. This allows the model to multiple the available days suitable for a given week by 12, which will result in the total hours available for fieldwork. However, since the timing of these operations is heavily dependent on weather, two additional percentiles were considered in the sensitivity analysis when adopting 1000-acres of cover crops to find the effect of weather on implementation. The suitable field day risk for the 15th and 35th percentiles represents risk-averse weather strategies and indicates a year with heavy rainfall. Identical to the risk-neutral case, the number of suitable days was multiplied by a 12-hour workday illustrating a one-person operation, resulting in the hours available per week.

In addition to suitable field day risk, sensitivity analysis of cover crop adoption was used to compare the impact on net returns and machinery selection at different levels of adoption. Furthermore, the results illustrated machinery impacts, production practice date changes, and the influence of suitable field days. The four cover crop scenarios tested within this study represent the level of cover crops planted on the farm. These levels are 500, 1000, 1500, and 2100 acres of cereal rye.

Two additional scenarios were conducted to test machinery sensitivity. The first was to test the change in production practices when rye required being drilled instead of broadcast planted. Broadcast planting can cause less than suitable plant establishment in a dry year. Furthermore, the optimal machinery solution does not consider the current sprayer in the cash crop operation. To address this, a scenario where only a 90-foot sprayer could be used was tested and compared to the 1000-acre scenario. This last scenario would represent the operation's inability to purchase any additional machinery.

Results: The net returns of the base case model with zero cover crop acres were $635,772 and were higher than any of the scenarios examined, including cover crops (Table 2.2). This net return was expected to be higher in the base case because no benefits of cover crops are considered in the model. In the base model, corn averaged a yield of 158.9 bushels per acre, with planting dates occurring during early April. At the same time, soybeans averaged 50.03 bushels per acre, with planting dates scheduled for late April into early May.

Cover crop acres at various levels were tested, and results were compared to the base case (Tables 2.2 & 2.3). When cover crops were adopted, net returns decreased by 2.5% for the 500-acre scenario, 4.7% for the 1000-acre scenario, 6% for the 1500-acre scenario, and 9% for the 2100-acre scenario. Cash crop yields were not affected for the 500 and 1000 acre scenarios. However, the planting dates for soybeans in the 1000-acre case illustrated an adjustment of 63 acres from April 8 and 12 Acres from May 13 to April 29. These scenarios illustrate that the decrease in net returns is solely attributed to the cover crops costs. It is worth noting that this relationship is not linear due to the change in machinery used that will be discussed later in this section.

Cash crop yields began to be affected once cover crops were pushed up to 1500 and 2100 acres. Corn yield in both scenarios increased by 0.5 and 0.8 bushels per acre, respectfully. On the other hand, soybean yields decreased by 0.3 and 0.6 bushels per acre, respectfully. These yield changes are due to the change in planting dates for both corn and soybeans. Corn planting dates move 112 acres from April 1 to April 8 and April 15 in the 1500-acre scenario and 201 acres from April 1 and 75 acres from April 15 to April 8 and April 22 in the 2100-acre scenario.

As for cover crop planting and termination dates, the planting of cover crops for the 500-acre scenario occurred on September 9 and September 16. The other scenarios planting dates in order of significance were September 9, September 23, November 4, September 16, August 8, and September 30. Termination of the cover crops were simply the earlier, the better, therefore they were directly connected to the planting date.

As previously mentioned, the decrease in net returns was not linear between the 500 and 1000 acre scenarios. Due to the change in machinery, the 500-acre case used a 40-foot pull behind sprayer to terminate the cover crops. However, once the acre requirement was increased to 1000, the decrease from the labor constraint was more significant than the cost of increasing the sprayer size; thus, a 50-foot sprayer was used in all other scenarios. Further investigation found that the pivot point for this change was at 818 acres of cover crops.

However, under the current assumption, the operation would be required to buy new machinery when they already own a sprayer. To compare the difference between purchasing a new sprayer and using the existing one, the model was restricted to using a 90-foot self-propelled sprayer for 1000-acres of cover crop termination. This scenario resulted in a higher net return than the 1000-acre scenario previously present and showed a decrease of 4% in net returns for the base case (Table 2.4). More interesting was the effect on cash crop yields, where corn yields decreased while soybeans yields increased from the base case of no cover crops. Both were due to shifts toward earlier planting dates. With a larger sprayer, labor was more efficiently used, and therefore, cover crop termination was performed faster. This, in turn, freed labor to be used in planting cash crops on high-yielding planting dates. Using the sprayer already owned in the hypothetical farm resulted in a loss of $25.61 per acre, which was lower than purchasing a dedicated sprayer for terminating cover crops.

As for cover crop planting, the hypothetical farm does not own a broadcast seeder or a drill. Therefore, either planting method would require the purchase of new machinery. In each scenario, broadcast seeding was preferred, but this method has shown limitations under wet soil conditions. When soil is wet, broadcast planting results in lower crop emergence. For this reason, a scenario was constructed to require the cover crop to be drilled at planting. Results showed at 1000-acres a further decrease in net returns of 5.8% compared to a broadcast seeder (Table 2.5). This is roughly 1% higher than the 1000-acre scenario, suggesting an additional $7 per acre need to offset the cost of the drill and shifting of the planting dates.

Cover crop adoption influences labor availability for cash crop operations by causing a labor shortage around planting times. The previous scenarios were calculated using a risk-neutral or 50th percentile, representing an average of 4.9 days of suitable fieldwork per week each year. Two levels were run with above-average rainfall to investigate the impacts of managing this risk. The first suitable field day level tested was the 35th percentile. This represents a slightly above-average rainfall with an average of 4.3 days of suitable fieldwork per week each year. The second scenario was tested at the 15th percentile, representing a heavy rainfall year with an average of 3.4 days of suitable fieldwork per week each year. Both risk levels were assessed with 1000 acres of cover crops and compared to the same risk level with zero acres of cover crops.

Results from both risk levels are presented in Tables 2.6, 2.7, and 2.8. In the 35th percentile case, net returns dropped by 7% when 1000 acres of cover crops were adopted. The loss came from a decrease of 1.5 bushels per acre for corn and 0.33 bushels per acre for soybeans, along with the added cost of cover crops. Cover crop termination was pushed into April due to the lack of available labor, which led to later planting dates for the cover crop in the following fall. When these results were compiled together in a year with slightly above average rainfall, an operation would expect to lose around $50 per acre.

In a year with heavy rainfall, the 15th percentile resulted in a decrease of 5.6% in net returns (Table 2.7). Corn yields dropped by 0.65 bushels per acre, and soybeans dropped by 0.11 bushels per acre due to later planting dates. In this scenario, cover crop termination was pushed back into mid-April and late-May. With the planting of the cover crop occurring later into the fall. Overall, the economic loss when planting cover crops in a massive rainfall year would be $32 per acre for the 1000 acres of cover crops. The massive rainfall year at 15% and the 35% suitable field days case were compared to the same risk level with zero cover crop to establish comparisons under the same risk levels. Comparing the cases at the same risk level suggests that the operation expects high rainfall in each comparison. Although if an operation were expecting a natural risk case at the 50% level and planted 1000 acres of cover crops, the net return decrease would be much higher. As a point of reference for the effect of weather, if the two risk levels at 0 acres of cover crops were compared to the zero acres of cover crops at the 50th percentile, net returns decrease would not change in the 35th percentile, but the 15th percentile would experience a decrease of 13%.

Conclusion: A linear programming model used resource allocation, sequencing, and machinery selection to determine optimal cover crop adoption for a Kentucky grain farm. Results suggest a 40-foot pull behind sprayer for termination of lower than 818 acres of cover. In contrast, a 50-foot pull behind sprayer was optimal when more than 818 acres of cover crops are terminated. Further results provide evidence of the amount needed in benefits to offset the cost of cover crops. All model scenarios suggested a cost between $25 and $51 per acre of cover crops, which is in line with previous literature (Roth, 2017). Some scenarios suggest that as little as a three bushel increase in soybeans would influence net returns to make cover crops profitable. However, net returns were more significantly affected in years with torrential rainfalls. The effect on net returns could be used as a baseline for policy implications concerning conservation program payments. These changes in net return represent the money needed for a farmer to adopt cover crops initially. Overall the results from this study should be used as a baseline for the compensation need from either government payments or cover crop benefits for adoption on a wide scale.

Table **Error! No text of specified style in document.**.1 Machinery Options Presented in the Model for Cover Crop Operations of Spraying, Planting, and Roller Crimping

Machinery Options		
Sprayer	Planting	Roller Crimping
40-Foot Pull Behind	12-Foot Drill	12-Foot Roller/Crimper
50-Foot Pull Behind	20-Foot Drill	20-Foot Roller/Crimper
60-Foot Self-Propelled	30-Foot Drill	30-Foot Roller/Crimper
70-Foot Self-Propelled	Broadcast Seeder	38-Foot Roller/Crimper
80-Foot Self-Propelled		
90-Foot Self-Propelled		
120-Foot Self-Propelled		

Table **Error! No text of specified style in document.**.2 Net Returns, Yields, and Planting Dates of Cash Crops for the Base Case and Cover Crop Acreage Scenarios

Acres of Cover Crops	Base Case of Zero Acres of Cover Crops	Scenarios of 500 Acres of Cover Crops Planted	Scenarios of 1000 Acres of Cover Crops Planted	Scenarios of 1500 Acres of Cover Crops Planted	Scenarios of 2100 Acres of Cover Crops Planted
Net Returns ($)	635772	618823	605541	591801	573840
Corn Yield (bu/acre)	158.9	158.9	158.9	159.4	159.7
Soybean Yield (bu/acre)	50	50	50	49.7	49.4

Corn Planting Dates and Amount (Acres)					
1-Apr	341	341	341	229	140
8-Apr	304	304	304	356	322
15-Apr	405	405	405	465	390
22-Apr	-	-	-	-	198

Soybean Planting Dates and Amount (Acres)					
8-Apr	66	66	3	9	135
15-Apr	432	432	432	371	167
29-Apr	192	192	266	208	99
6-May	224	224	224	230	392
13-May	137	137	125	232	256

Table **Error! No text of specified style in document.**.3 Rye Planting and Termination Dates with the Acreage Amounts for Each Date

Acres of Cover Crop by Planting Dates				
	500 Acres	1000 Acres	1500 Acres	2100 Acres
12-Aug	-	-	-	135
9-Sep	343	473	356	842
16-Sep	157	-	209	-
23-Sep	-	402	703	647
30-Sep	-	-	-	22
4-Nov	-	125	232	454

Acres of Cover Crop by Termination Dates				
	500 Acres	1000 Acres	1500 Acres	2100 Acres
18-Mar	341	341	229	140
25-Mar	159	304	356	457
1-Apr	-	230	474	557
8-Apr	-	-	-	198
15-Apr	-	-	-	99
22-Apr	-	-	209	392
29-Apr	-	125	232	256

Table **Error! No text of specified style in document.**.4 Sensitivity Scenarios for Machinery Including Net Returns, Yields, and Planting Dates of Cash Crops

Acres of Cover Crops	Base case	Level at Which Sprayer Size Changed (818 Acres)	Scenario for Forced Drilled Planting	Scenario for Forced 90-Foot Sprayer Termination
Net Returns ($)	635772	610461	578775	610081
Corn Yield (bu/acre)	158.9	158.9	159.1	158
Soybean Yield (bu/acre)	50	50	49.9	50.6

Corn Planting Dates and Amount (Acres)				
1-Apr	341	341	306	478
8-Apr	304	304	323	214
15-Apr	405	405	412	80
22-Apr	-	-	-	278

Soybean Planting Dates and Amount (Acres)				
15-Apr	66	55	398	228
22-Apr	432	432	268	322
29-Apr	192	204	259	400
6-May	224	224	125	42
13-May	137	135	-	59

Table **Error! No text of specified style in document.**.5 Rye Planting and Termination Dates by Scenario for Acreage Amounts for each of the Machinery Sensitivity Levels

Acres of Cover Crop by Planting Dates			
	Level at Which Sprayer Size Changed (818 Acres)	Scenario for Forced Drilled Planting	Scenario for Forced 90-Foot Sprayer Termination
26-Aug	-	156	30
9-Sep	473	177	-
23-Sep	402	306	970
28-Oct	-	237	-
4-Nov	125	-	-
11-Nov	-	125	-

Acres of Cover Crop by Termination Dates			
	Level at Which Sprayer Size Changed (818 Acres)	Scenario for Forced Drilled Planting	Scenario for Forced 90-Foot Sprayer Termination
18-Mar	341	306	-
25-Mar	305	333	-
1-Apr	230	237	-
8-Apr	-	-	600
15-Apr	-	-	400
29-Apr	125	125	-

Table **Error! No text of specified style in document.**.6 Net returns, Yields, and Planting Dates of Cash Crops for the Base Case and 1000 Acres Scenarios at the 35th percentile of Weather Risk

	Base Case	35th
Net Returns ($)	635772	586410
Corn Yield (bu/acre	158.9	156
Soybean Yield (bu/acre)	50	49.4

Corn Planting Dates and Amount (Acres)		
1-Apr	341	90
8-Apr	304	-
15-Apr	405	120
29-Apr	-	81
13-May	-	234
20-May	-	525

Soybean Planting Dates and Amount (Acres)		
15-Apr	66	412
22-Apr	432	109
29-Apr	192	-
6-May	224	-
13-May	137	202
20-May	-	327

Table **Error! No text of specified style in document.**.7 Net returns, Yields, and Planting Dates of Cash Crops for the Base Case and 1000 Acres Scenarios at the 15th Percentile of Weather Risk

Scenario of Cover Crops	Base case	15th
Net Returns ($)	585136	552313
Corn Yield (bu/acre	154.4	153.1
Soybean Yield (bu/acre)	47.1	47.3

Corn Planting Dates and Amount (Acres)		
18-Mar	32	-
25-Mar	54	123
8-Apr	144	150
15-Apr	51	30
22-Apr	246	226
29-Apr	231	204
6-May	179	181
13-May	51	-
27-May	62	128
10-Jun	-	8

Soybean Planting Dates and Amount (Acres)		
25-Mar	154	133
1-Apr	329	308
15-Apr	102	154
27-May	83	43
3-Jun	383	413

Table **Error! No text of specified style in document.**.8 Rye Planting and Termination Dates with the Acreage Amounts for Each Weather Risk Scenario

Acres of Cover Crop by Planting Dates		
	35th	15th
12-Aug	-	237
9-Sep	209	-
30-Sep	123	308
7-Oct	532	-
21-Oct	-	50
4-Nov	-	150
11-Nov	136	256

Acres of Cover Crop for Termination Dates		
	35th	15th
11-Mar	-	256
18-Mar	-	308
25-Mar	-	150
1-Apr	532	-
8-Apr	136	-
22-Apr	-	181
29-Apr	209	-
6-May	123	-
13-May	-	98
27-May	-	8

Figure **Error! No text of specified style in document.**.1 Percentage of Yield Expected Based on Planting Date of Cash Crops

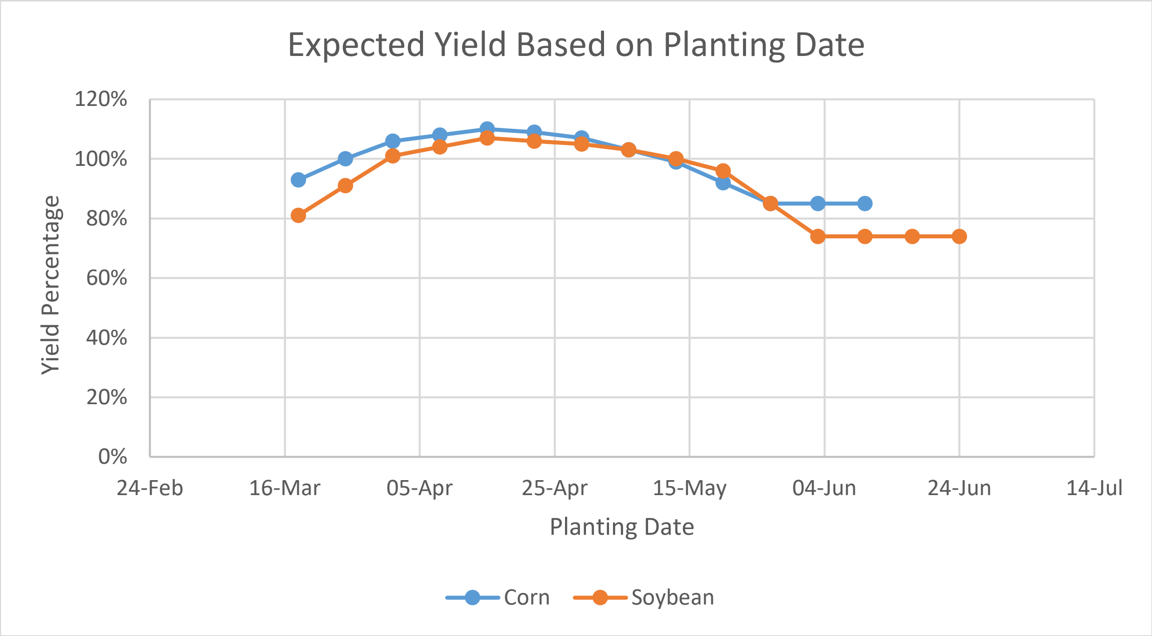

Figure **Error! No text of specified style in document.**.2 Decision Tool to Establish Cover Crop Cost. (This tool can be found at http://www.uky.edu/Ag/AgEcon/pubs/extCoverCrop08.xlsx)

Estimated Cost per Acre for Cover Crops

Cost		
	Labor Per Hour	$15.00
	Fuel	$3.10
	Planting Method	Drilled
	How was it terminated	Spray only
	Planter Type	12 Foot
	Sprayer Used	20 Foot Broadcast
	Number of passes with the sprayer	1
	Roller/Crimper Used	Did Not Roller/Crimp
	Number of passes with the roller/crimper	1

Estimated Seed Cost	
Seed type	Price per bag
Rye	$ 14.25
Clover	$ 72.00
Radish	$ 82.50
Oats	$ 13.03
Vetch	$ 108.50
Rape	$ 59.00

		Quant.	Unit	Price			Total
Machinery Cost							
	Fuel & Lube	0	Acre	0	Calculate Machinery Cost?	Yes	$5.39
	Repairs	0	Acre	0			$3.75
	Labor	0	Acre	0			$3.71
Custom Hiring							
	Custom Machinery	1		0			$0.00
Inputs							
	Seed	1.5	Bags per Acre	$14.25			$21.38
	Herbicide	1	Acre	$18.35			$18.35
	Other	1	Acre	$0.00			$0.00

Total Variable Cost

$52.57

Total Ownership Cost

$5.80

Total Cost

$58.37

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